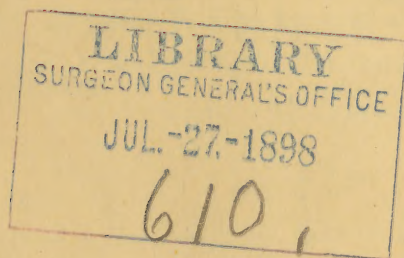


Morton (Thos G.)

Details of a case, in  
which death is supposed  
to have resulted from ether  
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which occurred in the practice of Dr. Boisnot, of Philadelphia. Hamilton, in his work on Fractures and Dislocations, mentions only a single example of this injury, that of Professor Gibson. Each of these cases, where the particulars are given, differed from each other, as well as from the one here recorded in regard to the character of the dislocation; in one the displacement being iliac and thyroid, in the other iliac and pubic, while the one here recorded was iliac and ischiatic.

The exceedingly small number of cases in which both hips have been dislocated, would seem to indicate that the conditions which render such an occurrence possible are very rare and peculiar. I have, therefore, taken some pains to learn from the subject of this report what the circumstances were which attended his injury. He states that he was at work, standing on a surface which inclined at an angle of about forty degrees, with the feet widely separated, the right one being much lower than the left, and the body bent forward. While in this position a large mass of rock, weighing many hundred pounds, fell from the roof, several feet above him, striking him in the lower dorsal region, bending the thighs upon the body and pressing him forcibly down upon the rock on which he was standing. He is certain that both joints were dislocated at the same instant, as the falling rock immediately rolled or slid from and released him. Severe bruises upon his back, and a deep cut on the right arm were the only other injuries received.

WILKESBARE, July 28, 1876.

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ART. XII.—*Details of a Case, in which Death is supposed to have resulted from Ether used as an Anæsthetic; with a Brief Account of all the Fatal Results which have been ascribed to the use of Anæsthetics at the Pennsylvania Hospital; with Remarks.* By THOMAS G. MORTON, M.D., Surgeon to the Pennsylvania Hospital.

DAVID D. P., aged 19, single, a telegraphic operator, consulted me in May, 1876, in regard to his right limb, which was quite useless from general atrophy, and an angular partial ankylosis of the knee, evidently a result of old scrofulous inflammation. I advised division of the flexor hamstring tendons, which were very much contracted, and immediate straightening of the limb, and directed an appropriate brace to be made, with a high heel and sole to the shoe for after use. On the 2d of June the patient was admitted into the hospital, when the following notes were made by Dr. W. B. Hopkins, the resident in charge: "Until the patient was two years old, when he began to walk, he had been considered a perfectly healthy child; soon after this a posterior spinal curvature developed; when four years old, inflammation of the knee set in, with subsequent contraction of the flexor thigh muscles, with general arrest of development in the limb, and subsequent partial ankylosis of the knee-joint; the angle



of deformity being slightly obtuse, there had been, apparently, no suppuration of the joint, at least to the extent of an abscess."

"The spinal and limb troubles combined prevented the patient from walking until he was six years old, when, with crutches, he began to get about; there is no history of winter cough or previous chest trouble, and his general health, although not being vigorous, seems not to have been markedly impaired, and no evidence of any hereditary disease can be traced out. The patient is rather pale, but his appetite is good, and he expresses himself as in excellent health; there is marked posterior curvature, which has produced the usual deformity, with great sternal prominence. The right limb is much atrophied and shortened, and presents angular deformity, with a partial luxation backward of the tibia, the anchylosis not being complete. June 3, after a consultation with Drs. Hewson and Hunt, the tendons were divided, and the limb was straightened, and the apparatus, made especially for the case, was adjusted by Mr. Kolbé."

The etherization was conducted by Dr. Wharton, one of the resident physicians; at the close of the operation I saw that the patient was pale, somewhat depressed, but as comfortable apparently as we generally observe after the use of an anæsthetic. The patient was left in charge of Dr. Hopkins, whose subsequent notes are as follows: "At 12.30 P. M., patient, having been removed 15 minutes ago to his room, was seized with symptoms of asphyxia; pulse moderately full, 160; respirations nearly ceased; general cyanotic condition more marked in the face and tips of the fingers; his tongue was at once depressed, cold water dashed on his chest, which produced only violent respiratory efforts. At 1 P. M. condition remains much about the same, and there being evidences of pulmonary engorgement, with frothy blood-stained mucus, constantly collecting in the throat, while the heart's action was active and laboured, the radial artery was opened, and about 8 oz. of blood were drawn; dry cups were applied to the chest; for a time the respiration seemed slightly improved; the volume of the pulse increased somewhat, and fell from 160 to 152 per minute. At 1.45 rapidly sinking; hypodermics of whiskey and carbonate of ammonia were used without avail." Dr. H. sent me the following note: "P. died at 2 P. M.; about ten minutes after the operation he was removed to his room, being perfectly conscious, and I having seen to it that he had perfectly recovered from the ether, he suddenly became asphyxiated; the ordinary remedies proved of no avail."

Dr. Morris Longstreth, the hospital pathologist, made the *post-mortem* 21 hours after death. "The rigor mortis was well marked; there was considerable deformity of the chest; the lumbar portion of the spinal column was at its lower part bowed backwards, so that the last two vertebræ were nearly in a right line with the upper portion of the sacrum, thereby making the cavity of the pelvis very capacious. The abdominal viscera were normal, although somewhat out of position. Thorax—the pleural cavities contained a considerable amount of serum, included in the meshes of an abundant firm net-work of inflammatory adhesions (old). The serum contained no recent lymph, and it was impossible to determine its quantity, on account of the very great amount of similar serum pressed out from the lungs in the process of their removal; the lower part of the right pleural cavity was, to a considerable extent, obliterated by very firm adhesions existing between the diaphragm and the costal pleura. The amount of serum was not very great at any one portion of the pleural sac, but rather diffusely infiltrating the adhesions present. Both lungs were

moderately well crepitant throughout, pitted deeply on pressure everywhere; on section, serum frothy and a little bloody exuded with great freedom and in large amount, as though from a saturated sponge; their cut surface was grayish, showing some blood points; there was no solidification or even deep congestion of their tissues. Divided portions as well as the whole floated well in water, and there was no evidence of plugging of their vessels, and the blood in them was entirely fluid. Pericardium contained a considerable amount of clear, very pale serum; the heart was only moderately in a state of muscular contraction, a slight amount of fat covered its surface along the grooves; the blood within the cavities was quite fluid; the muscular tissue, the valves, and the large vessels were all normal. There was no foreign substance of solid nature discovered in the larger bronchi or in the trachea. The other parts of the body were not examined."

The unfortunate result in this case, apparently caused by ether, naturally produced, not only upon myself, but upon those who had a knowledge of it, a profound impression, as it was seemingly a proper one for the use of the anæsthetic. Ether or "washed ether" as an anæsthetic agent has been uniformly looked upon as perfectly safe; personally, I have administered it on all occasions, at all periods of life, from infancy to extreme old age, with the feeble as well as in the strong. In giving ether I have never used any "inhaler," so called, but have invariably made use of a napkin or coarse towel, on which the ether is poured, when the cloth is then simply folded in a conical shape, and held over the patient's mouth and nose; so soon as the napkin becomes the least soiled or "ether-logged," a fresh one is substituted. Dr. Wharton, the resident who gave the ether in this case, says: "I am satisfied that not over two and a half or three ounces were administered in P.'s case; he seemed to be readily affected, and was not under its influence over twenty minutes. There was no vomiting, and the respirations were not laboured; on removal of the napkin he rapidly regained consciousness." Although this patient had a marked spinal curvature, with chest capacity below the average, anæsthesia on this account was not contraindicated, for I have frequently used ether in cases where the deformity of the chest was much more marked without the least difficulty. The autopsy demonstrated that the lungs were seriously restricted in their natural movements by the adhesions which bound them down in all directions, and consequently the secretions which formed were not expelled; at the close of the etherization there was no evidence of any mucous collection, at least when I last saw the patient at 12 M.; fifteen minutes later, when Dr. Hopkins was called, the change was very marked, and it was during this short interval that the serious symptoms were manifested. Mucous secretion, which often rapidly forms, is one of the most annoying symptoms in the course of etherization; in many cases it is not observed at all, but when it occurs to any extent, it is much safer to suspend anæsthesia until the throat is thoroughly cleansed, or the patient is relieved by his own efforts. I have often ob-



served that those patients who have been the most difficult to manage while being etherized, are the easiest to keep anæsthetized after the first excitement of the ether has passed over, and seldom suffer from any mucous secretions. Gross,<sup>1</sup> when on the subject of death from ether, says:—

“How the inhalation of ether proves fatal has not been decided; when death occurs promptly, as during, or very soon after, the administration, the probability is that it is caused by asphyxia, whereas, when it occurs at a later period, as after the lapse of hours or days, there is reason to believe that it is due to the effects of congestion of the brain and lungs, either alone, or in conjunction with gastric irritability, which often exists in a most distressing degree.”

In P.'s case death was the result of the mucous secretion and serous effusion which invaded every available space, thus suffocating the patient; there was not the least evidence of any intracranial difficulty; the patient was quite rational to the close.

There is seldom any danger from ether when properly administered, and there is abundant evidence to show that fatal results are less likely to follow its use than any other anæsthetic agent. The fact of ether having uniformly been looked upon as a perfectly safe agent on every occasion may, I am inclined to think, have induced great carelessness in its use; the occasional deaths from, or at all associated with ether, should in the future be sufficient to serve as cautionary signals, a constant watchfulness should be observed by the etherizer, and every symptom carefully noted, especially all complications arising from bronchial secretion, pulse failure, or vomiting, and I am satisfied that not only should the patient be watched by a medical man during anæsthesia, but until reaction has been thoroughly established, and the ether effects entirely passed over; I have seen, as probably all surgeons have, ether poured upon the inhaler or napkin in great excess, so as to flow down on the patient's face and neck; the cloth thus becomes saturated, is not pervious to air, and the patient almost suffocates; such practice cannot but be severely condemned.

The assistant should devote his attention exclusively to the patient, while a few drachms at a time, with care, poured on the napkin will generally induce anæsthesia promptly; when the napkin becomes the least soiled, another should be substituted, and when complete anæsthesia has been induced, occasional inspirations of pure air should be allowed. Ether has been most successfully employed in the Pennsylvania Hospital for more than twenty-five years; it was introduced about 1850, and first used in a case of luxation of the femur, which resisted repeated attempts at reduction with the pulleys; it is needless to say that after etherization no difficulty was experienced, and from that time to the present this agent has been in daily use, and with the few exceptions herein noted has been the only anæsthetic employed.

<sup>1</sup> Surgery, vol. i. 569, 5th ed.

Ten years or so ago, a mixture of ether and chloroform was occasionally used, but a fatal result which occurred, led to its final abandonment.

The subject referred to was a German, aged 35, who was admitted with severe railroad injury of the ankle. I performed an amputation of the leg, using ether as the anæsthetic; a rapid recovery followed; some necrosis of the tibia developed, and my colleague, Dr. Hewson, into whose care the case had passed, thought best to remove the dead bone; and accordingly on May 4th, 1865, the operation was undertaken. The late Dr. Ed. Rhoades, then the resident, in his report of the case, stated, "that the patient died in convulsions during the administration of an anæsthetic for the removal of necrosed portion of tibia; convulsions occurred before anæsthesia was produced; the mixture used was chloroform, two parts; ether, three parts; alcohol, one part." This patient had been a robust man, took ether at the time of amputation well, so that the unfortunate result cannot be laid at the door of the agent ether, but rather to that of the chloroform. I believe no post-mortem was allowed.

The second fatal case occurred about 1867; a feeble old man was admitted, with a strangulated hernia of some days' duration, into Dr. Hewson's ward; the patient was a hard drinker, he had suffered much from exposure and insufficient food; after etherization, it was found impossible to return the gut, and herniotomy was decided upon, the anæsthesia having already been kept up a considerable time; Drs. Hunt and Agnew were also present; the patient took ether badly, and soon after the operation was commenced, a copious bronchial secretion kept filling the patient's mouth, and during an effort to expel this a very large portion of the bowel was forced out; at this time the breathing became labored, and the pulse faltered, the mucus which collected could not be expelled, and asphyxia developed rapidly; the galvanic current and other remedial agents were vigorously tried, but the patient expired on the operating table. In this case the great feebleness of the patient, his previous bad habit, alcoholism in fact, associated with the depressing effects of the strangulated bowel, would have been almost sufficient to have induced a fatal result, had the operation been performed without ether; yet, the ether was unquestionably the immediate cause of death.

The only other fatal result associated with ether that I know of as having occurred in the Hospital was in the early fall of 1872; the subject was a man of 35 years of age, he came from the far west for amputation, was in the care of my colleague, Dr. Levis; a gunshot wound of the thigh had involved the femur, producing a comminuted fracture; consolidation, however, took place, but considerable necrosed bone remained, and abscesses with numerous fistulous sinuses formed, through which immense quantities of pus escaped; at last it became a question of life or limb. Just before the etherization, which was commenced in the ward, 20 grains of chloral were given, and when the anæsthesia was completed, the patient was carried into the amphitheatre, after having lain some little time in the hall leading to the clinic room, etherization being fully kept up; just as the operator was prepared to commence the amputation, collapse occurred and death followed at once; no examination, I believe, was permitted.

My friend, Dr. Hunt, some time ago<sup>1</sup> asked the question, "are the kidneys active eliminators of ether?" and at the same time reported the case

<sup>1</sup> Phila. Med. Times, Feb. 6, 1875.



of a young man brought into his wards with a crush which required amputation of the forearm; after a few inhalations of ether the pulse failed, and the patient seemed sinking; the etherization was suspended, and restoratives were applied, and the patient slowly reacted. In the afternoon another attempt was made to etherize, and after a few whiffs, a repetition of the morning's experience was threatened; the operation was performed without the ether; for a few days the patient did well, then rapidly grew worse, became feverish and delirious; the stump ceased to heal, surgical fever was diagnosed, but pyæmia was not marked. Death occurred two weeks after the injury, and the post-mortem showed the kidneys to be in a marked stage of fatty degeneration, which materially interfered with their eliminating power. No examination of the urine had been made, for there were no symptoms which seemed to call for such an investigation. Dr. H. remarks, "May not conditions of this kind often explain the unpleasant and even fatal action of an anæsthetic? The practical lesson is obvious: before a serious operation, should there be the slightest reason to suspect hidden trouble, examine the organs and secretions and be on guard." I counsel even more than this, that, before any operation or etherization, the urine may profitably be examined. Although I have never known ether to act in the manner noticed by Dr. Hunt, yet I can readily understand that with a uræmic condition, the additional ether-intoxication, the heart's failure may readily be accounted for. In quite a number of instances, however, when I have been compelled to use ether, at the same time well aware of an albuminous condition of the urine, no bad results were experienced. In a case lately of tumour of the breast, which was sent to me for operation, in a subject otherwise apparently robust, I declined to remove the growth after an examination of the urine, which showed a large amount of sugar.

In 1866 I used the nitrous oxide gas quite frequently in the hospital, not only in operations which were rapidly performed, but in a large number of major operations, including several thigh and leg amputations; in some respects the gas acted satisfactorily, but the intense venous congestion, and death-like appearance of the patient, and rapid pulse, which always occurred when anæsthesia was kept up for some minutes, made me very anxious.

Dr. J. D. Thomas, of this city, who has had a vast experience in the administration of gas for the extraction of teeth, having given it in more than sixty thousand cases, tells me that he has never had any bad results from its use. In minor operations, which can be rapidly performed, a small amount of gas is all-sufficient, and since there are no unpleasant after-effects, as we have sometimes from ether, it is on this account often a more satisfactory agent. The great drawback to the more general introduction of the gas is from the difficulty in carrying it about, while a long experience in its use has demonstrated that it is a dangerous agent when its



effects are continued for any length of time. Ether, on the contrary, may be used with impunity, for patients may be kept under its influence for hours, or even days, without danger. Some years ago my friend, Dr. E. Wilson, was called to a case of convulsions, after a forced labour at seven months. The patient had just completed the sixty-fourth convulsion. Dr. W. at once sent for ether; before it came another convulsion had passed over. He at once used this anæsthetic, and kept his patient under its influence uninterruptedly for four days and nights, using, during that period, more than *two gallons of ether*. His patient had no further convulsions, and finally recovered.

In order that I might know the kind of ether used at the hospital, I directed Mr. C. Wirgman, our apothecary, to address the well known chemists, Messrs. Powers & Weightman, on the subject, who replied as follows, under date of August 2, 1876 :—

"Your letter asking for information in regard to the purity of the 'washed ether' which we supply the Pennsylvania Hospital has been received. In reply, we would say that we believe our article to be pure, the usually recognized tests confirming us in this belief. In making our ether we follow the process published in the U. S. P., and wash with water as a preparatory step to making the 'stronger ether,' the specific gravity, according to our own and other weighings, will vary from .7299 to .7324 at 60° Fahr., and never finish off less than ten gallons at a time. While we regret exceedingly the sad result in the case mentioned in yours, we cannot think the anæsthetic the cause, but rather due to some idiosyncrasy of the patient, having had no complaint from others supplied with the ether made at the time and from the same lot as that sent you."

The histories of the cases which have been given, comprise all the unfortunate examples which are known to have occurred in the hospital; even these unfavourable results do not lessen in the least my entire confidence in ether as a safe agent, but with this, as well as with all anæsthetics, the details of the cases reported offer a caution, that in every instance the greatest care should be exercised, guarding against all and every source of danger which may probably arise. Thus the very slight mortality ascribed to or in any wise associated with ether may yet be lessened or entirely averted.

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ART. XIII.—*Report of a Case of Fracture of the First, Second, Fifth, and Sixth Cervical Vertebrae, with Recovery and Autopsy.* By C. S. MAY, M.D., Second Assistant Physician, Connecticut Hospital for the Insane, Middletown, Connecticut.

THE following report of a case of fracture of the cervical vertebra at two points, with extreme compression of the spinal cord in the atlo-axial region, I offer to the profession because of the remarkable prolongation of life, with good physical health, and restoration of most of the neurotic

DR. A. E. FOOTE

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